

CLAIMS

What is claimed is:

1. A ballast protecting device, comprising:
a voltage sensing circuit adapted to receive an AC input voltage across first and second voltage input terminals;
a current sensing circuit having an input connected to the first voltage input terminal and a first output connected to one output terminal of the device;
a pulse forming circuit having an input connected between an output terminal of the voltage sensing block and a second output of the current sensing circuit, wherein the output terminal of the voltage sensing block provides a reference signal in phase with the AC input voltage, and the second output of the current sensing circuit provides a signal representing a phase of a current through the device relative to the reference signal;
a switch unit arranged between the second voltage input terminal and another output terminal of the device, and
controller means operatively connected to the pulse forming circuit and the switch unit for determining a phase angle difference between the reference signal and the current through the device and for controlling the switch unit in response to the determined phase angle difference,
wherein the switch unit electrically disconnects the second voltage input terminal from said another output terminal of the device when the controller means determines an undesired phase angle trend.
2. The device of claim 1, wherein the pulse forming circuit comprises a comparator which provides a series of square wave pulses during a positive half-wave of the AC input voltage.
3. The device of claim 2, wherein the pulse forming circuit further comprises a comparator which provides a series of square wave pulses during a positive half-wave of the signal representing the phase of the current through the device.
4. The device of claim 1, wherein the pulse forming circuit comprises a comparator which provides a series of square wave pulses during a positive half-wave of the signal representing the phase of the current through the device.

5. The device of claim 1, wherein the switch unit comprises an electromechanical relay which, when in an open state, interrupts a current flow between an input terminal and an output terminal of the device.
6. The device of claim 5, wherein the switch unit further comprises a solid state switch electrically connected across the electromechanical relay, wherein the solid state switch interrupts the current flow between an input terminal and an output terminal of the device upon detection of a current zero crossing condition.
7. The device of claim 6, wherein the solid state switch is a triac.
8. A method for controlling a ballast current, the method comprising:
 - establishing a reference phase angle of an input voltage;
 - sensing a phase angle of an input current with respect to the reference phase angle;
 - forming pulses representing the reference phase angle and the input current phase angle;
 - analyzing the pulses and determining a trend of a relative input current phase angle over a time period; and
 - interrupting the ballast current upon determining an adverse phase angle trend.